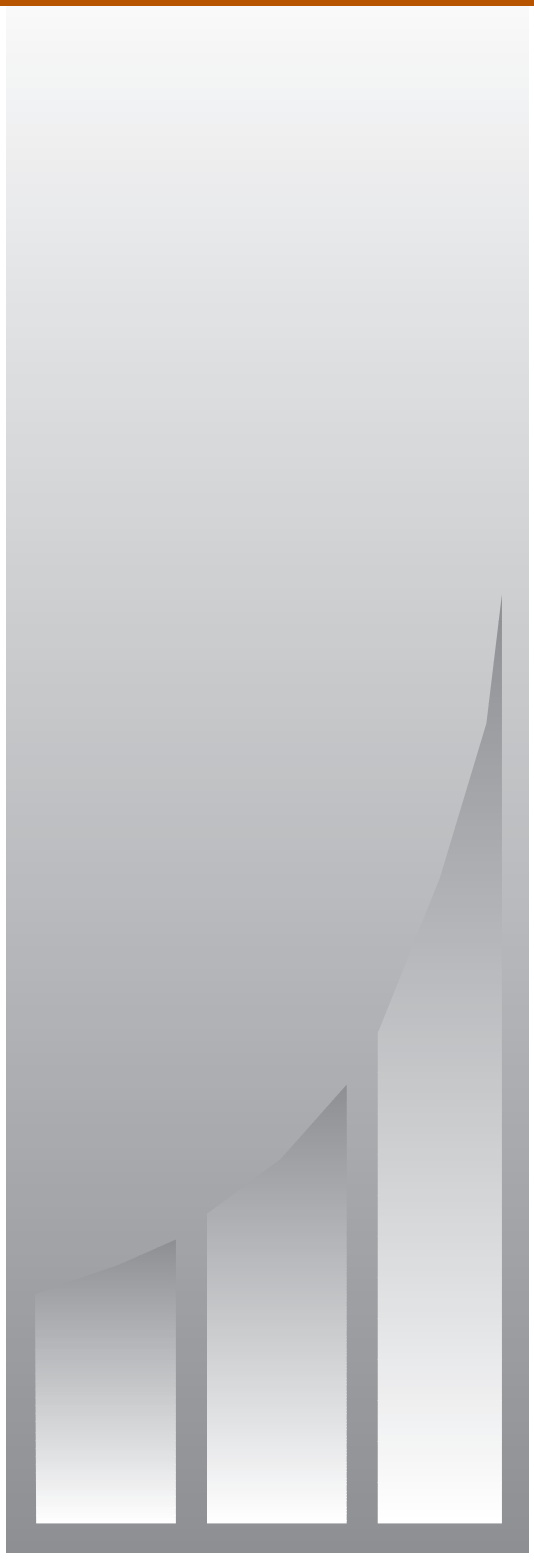

Education Reform in Colombia

George J. Borjas
Olga Lucía Acosta

FEDESARROLLO

WORKING PAPERS SERIES . DOCUMENTOS DE TRABAJO

Agosto de 2000 ● No. 19

This Version, June 2000

EDUCATION REFORM IN COLOMBIA*

George J. Borjas, Harvard University
Olga Lucía Acosta, Fedesarrollo

Abstract

Public education is one of the largest components of the public sector in Colombia, in term of its size, share of public expenditures, and geographic coverage. In 1997, Colombia had 85 thousand educational establishments, 390 thousand teachers, and 8.6 million students. In addition, public school teachers and educational staff comprise the highest percentage of public sector employment. During the last half of the 1980s, the Central government promoted a reorganization of the state administration to give municipalities a greater responsibility in financing and administering most public services. This paper examines various aspects of the public education system in Colombia and evaluates the impact of the educational reforms adopted in the last decade. Our empirical analysis suggests that with the exception of teacher salaries, which experienced a significant increase after 1994, the trends in several measures of educational outcomes are roughly similar both before and after 1994. It seems unlikely, therefore, that the education reforms had much impact on Colombia's education system. The paper concludes by making a number of policy recommendations that could improve the allocation of resources in this large and important sector.

* We thank Lorena Hernández and Alejandra Corchuelo at Fedesarrollo for excellent research assistance; Francisco Javier Lasso at the National Planning Department for the construction of data series, and all the participants at the Cartagena meeting.

I. Introduction

Public education is one of the largest components of the public sector in Colombia, in term of its size, share of public expenditures, and geographic coverage. In 1997, Colombia had 85 thousand educational establishments, 390 thousand teachers, and 8.6 million students. One out of every five Colombians is currently enrolled in the public education system, and 36 percent of central government tax revenues are allocated to public education. In addition, public school teachers and educational staff comprise the highest percentage of public sector employment.

During the last half of the 1980s, the Central government promoted a reorganization of the state administration to give municipalities a greater responsibility in financing and administering most public services. Therefore, the reorganization of the education system was developed in the context of a general decentralization of public administration. However, there has been some confusion as to which level of government is best suited to administer the public education system. Law 29 of 1989 favored the municipalization of public education, but the 1991 Constitution emphasized the role of the departmental level. Similarly, Law 60 of 1993, which regulates the system of transfers of central funds to departments and municipalities, enhances the role of municipalities in the administration of public funds for education. In contrast, Law 115 of 1994, the General Education Law, responded to pressure from the teachers' union and assigned a greater role to the departments. This confusion is reflected in the fact that there are three different types of public school teachers in Colombia: the central government funds national teachers, departmental governments fund departmental teachers, and municipalities fund municipal teachers.

It is widely recognized that there are serious inefficiencies in the allocation of resources in Colombia's public education system. These inefficiencies include the setting of teachers salaries by the central government, the generosity of the pension systems available to teachers, and the allocation of educational resources to different geographic areas. This paper examines various aspects of the public education system in Colombia. We begin our analysis with a description of the main institutional features of public education in Colombia. We then evaluate the impact of the education reforms that took place in the early 1990s. Our empirical analysis suggests that with the exception of teacher salaries, which experienced a significant increase after 1994, the trends in several measures of educational outcomes are roughly similar both before and after 1994. It seems unlikely, therefore, that the education reforms had much impact on Colombia's education system. We conclude by making a number of policy recommendations that could improve the allocation of resources in this large and important sector.

II. Institutional Characteristics

Table 1 reports the trends in public employment in Colombia. In relative terms, public employment peaked in 1980, when it made up 9.3 percent of the occupied population. By 1999, 7.8 percent of the occupied population was employed in the public sector.

Table 2 shows that these civil servants are concentrated in three groups: teachers, judicial employees, and the military. The teachers make up the largest group and accounted for 26 percent of public employees in 1999.

A. Education Reforms

A key goal of the 1991 Constitution was to offer universal coverage in basic education (nine grades) to Colombia's population. To achieve this goal, the Constitution initiated the process of decentralizing the administration of the public education system.

Table 1. Evolution of Public Employment

Years	Thousands of workers	% of occupied population	Annual rate of growth
1970	437.8	6.5	-
1975	608.4	8.2	6.8
1980	846.0	9.3	6.8
1985	913.4	8.8	1.5
1990	986.6	8.2	1.6
1995	994.0	7.2	0.1
1996	1001.3	6.8	0.7
1997	1025.5	6.8	2.4
1998	1103.5	7.2	7.6
1999	1193.6	7.8	8.2

Source: Encuesta Nacional de Hogares. DANE. Several years.

Table 2. Main Groups of Public Employees, 1999

	Number of employees	% of total
Teachers	310,000	26.0
Military and police employees	225,000	18.9
Judges and judicial employees	40,900	3.4
Total public employment	1.193.600	100.0

Source: Encuesta Nacional de Hogares. DANE.

It is worth pointing out that through these reforms, Colombia hoped to resolve one of the main sources of administrative and labor conflicts in the education system: the vagueness with which responsibilities are allocated to the various levels of government.[1] As we will see, however, the reforms did not completely solve these issues, nor did they address a key source of the chronic financial predicament facing public education: the level of government responsible for providing public education is not the level of government that pays for it.

B. Education Bureaucracy

Colombia has a central government, 1170 municipalities, 4 special districts and 32 departments. The regent Nacional Constitution (1991) defines the country as unitary, but decentralized. During the 1990s, the jurisdiction in education was defined as follows:

The administration of the public education system in Colombia has three levels: the central level includes the Ministry of Education and other relatively autonomous agencies addressing issues related to higher education or to science and technology. The departmental level includes the Departmental Secretaries of Education, the Regional Educational Fund created to administer the resources transferred

[1] Although from the Constitution of 1886, the Departments and other territorial entities had the responsibility of looking after the primary education, the constitutional reform of 1968 established that the Law would determine the services in charge of the Nation and of the territorial entities. See Gomez Buendia Hernando and Rodrigo Losada-Lora (1984).

Table 3. Distribution of Education Functions According to the Constitution of 1991 (Law 60 of 1993 and 115 of 1994)

Nation	To establish technical, curricular, and pedagogical norms that will be used by the territorial entities as an orientation.
Department	To plan, administer, and coordinate the teaching service, and to decentralize it in the municipalities. To assume the functions of technical development of the pilot centers. To prepare the teachers. To administer the funds of confinancing with own resources and to take care of the infrastructure and investments in the educational establishments.
Municipalities	To administer the pre-scholar, primary, secondary, and medium service on the terms that the department delegates. To make the necessary investments in infrastructure and maintenance of the educational establishments. To inspect and supervice the provision of educational services.

by the central level, and other educational institutions responsible specially for the training. Finally, the municipal level is represented in the big cities by Municipal Secretaries of Education.

There is currently a great deal of confusion and incoherence in the administration of the public education system. Much of this confusion arises because there is still a lack of clarity in the objectives assigned to each of the administrative levels. There are many instances in which the governmental entities that should administer certain functions do not have the tools necessary to carry out those functions. For example, the municipalities should have a central role in the administration of the education sector, but they have very limited authority for the management of human resources in that sector. Similarly, the existing regulations emphasize the importance of the Department in planning educational development, but the Departmental level has little access to the financial resources that are required to conduct this job properly. The problems faced by all levels of governments are aggravated by situations such as:

- The Ministry of Education lacks an appropriate data information system that would allow it to evaluate the current state of public education. For instance, information on the number and financing of public school teachers is only available up to 1991. Although there are existing instruments of collecting data on schools and students, the data are not reliable because there is no quality control.
- There are no mechanisms in the central government to evaluate if the departmental secretaries of education (or the other departmental educational agencies) implement the national norms for the administration of the teachers. The monitoring issue is equally problematic in the Departments and municipalities. The Departmental supervisors often reach decisions based more on political recommendations than on the merits of particular policy choices, and neither their functions not the policy options are clearly defined.
- The Ministry of Education does not have an appropriate mechanism to monitor and evaluate the use of the financial resources that are transferred to the departments and municipalities.

C. Financing

As Table 4 shows, public expenditures on education increased rapidly in the 1990s, from 3.2 percent of GDP in 1990 to 4.5 percent in 1997. Expenditures by local governments account for a growing part of total expenditures on education. Since the enactment of Law 60 of 1993, which implemented articles 357 and 358 of the National Constitution, the transfers of current incomes from the Central Government to territorial entities for expenditures in basic public services (such as education, health and

Table 4. Public Expenditures on Education as percent of GDP

Year	Central Government	Local Government	Total
1991	0,8	2,3	3,1
1993	1,3	2,5	3,8
1994	1,0	2,5	3,6
1996	1,6	2,8	4,3
1997	1,6	2,9	4,5
Average, 1970s	1,1	2,0	3,1
Average, 1980s	0,9	2,5	3,4
Average, 1990s	1,3	2,6	3,8

Source: Misión Social DNP, Based on formulary F-400 of the DANE.

basic water and sewerage) has grown by more than 2 percent of GDP. Nearly 65 percent of these transfers have been assigned to the education sector, mainly to improve the wages of teachers.

Table 5 shows that the municipalities and Departments contribute a relatively small amount (14 percent of the total) to the financing of public education. It is worth noting that-in addition to the transfers mandated by the Constitution-it was necessary to create a Fund of Educational Compensation in 1996 to finance the budget deficits caused by education expenditures by local jurisdictions.

Table 5. Financing Public Education, 1997

	Percent of total
National Transfers	**86**
Situado Fiscal (to the departments)	53
Current Income Participation (to the municipalities)	16
Educational Compensation Funds	14
Confinancing	3
Own Resources	**14**
Departments	5
Municipalities	6
Royalties	1
Credits	2

Source: National Planning Department, "Como va la Decentralización, 1998".

Finally it is important to note that the geographic distribution of the transfers is inefficient and inequitable. The monetary transfers are based on the number of teachers as of 1993, regardless of changes in underlying conditions.

Table 6 shows that 68.4 percent of the teachers are employed in the public sector. About 80 percent of the teachers in the public sector are employed by the central government or are nationalized, while 20 percent work for departments or municipalities.

D. Teachers Union and the Estatuto Docente

As in other countries of Latin America, the association of teachers in Colombia combines aspects of a professional association and a conventional labor union. Overall, however, educational policies have not been the main interest of FECODE, the Colombian Federation of teachers. Instead, most of the union's actions suggest that the key goal is to improve the economic and professional status of teachers.

Table 6. Number of Teachers by Educational Level
Public Sector and Private Sector, 1997

Educational Level	Public number of teachers	Public percentage	Private number of teachers	Private percentage	Total
Preschool	20,749	47.9	22,613	52.1	43,362
Basic primary	141,872	78.3	39,349	21.7	181,221
Basic and medium secondary	104,390	63.0	61,428	37.0	165,818
Total	267,011	68.4	123,390	31.6	390,401

Source: DANE. Social Indicators.

The conflicts between the government and FECODE have typically arisen over financial and administrative matters. The financial conflict arises because of the systematic inadequacy of funds for public education. The origin of the administrative conflicts lies in the confusion over the functions assigned to the various levels of government. FECODE supports the nationalization of public expenditure in education because, as Duarte (1996) states, "this will enhance its power as a national intermediary between the central government and the teachers. This also explains the strong opposition of FECODE to the descentralisation..."

The current regulations of the teaching profession in Colombia have their origin in an educational statute (Estatuto Docente) promulgated in 1979. This statute specifiees the norms that regulate the recruitment, labor stability, promotion, and retirement of teachers. The statute, and particularly the way it has been administered, have introduced a number of inefficiencies into public education.

- *Too much centralization*: Teacher salaries are set by the central government, with little input from the regional government agencies that end up paying the bill.
- *Inefficient appointment process*: The Departments and the Municipalities can create temporary teaching positions. The provisions of the Estatuto Docente imply that these short-term positions eventually become permanent positions, putting additional pressure on the central government to increase its monetary transfers.
- *Ineffective disciplinary regime*: The directives (rectors) do not exercise any disciplinary control over the teachers. The Estatuto Docente orders that promotions be determined internally within the magistery, using a set of rules that are not always related to teaching activities.

According to the regulations outlined in Law 4 of 1992 and in Law 60 of 1993, the President of the Republic must set the remuneration of the teachers who are subject to the relevant regulations in the Estatuto Docente in the first ten days of every year. Table 7 reports the rate of growth in teacher salaries between 1994 and 1998. Although the real teacher salary declined slightly in 1995, it has risen considerably since then, at an annual rate of about 3 percent.

E. The Pension System[2]

On average, teachers in Colombia are 43 years old. They tend to be relatively older than other workers. As Table 8 shows, the pension benefits granted to teachers are extremely generous. The table com-

[2] This section is based on the technical and preliminary memorandums of the team charged with preparing information on social security reform.

Table 7. Percent Real Growth of Teachers Salaries in the Public Sector

1995	-0,4
1996	2,9
1997	3,2
1998	6,3

Source: Secretaría de Educación Distrital, Authors calculation.

pares the pension benefits available to teachers with those established in Law 100 of 1993 (or Law of Social Security Reform) for other workers in Colombia.[3] A number of differences are worth noting:

First, public teachers do not have to contribute to the funding of the system in order to receive a pension. Most non-teachers contribute 25% (13.5% is obligatory).

Table 8. Pension Benefit Regimes of the Magistery and Law 100 of 1993

Benefits	Special Pension Pension de gracia[1]	Retirement Pension[2]	Retirement Pension by old age	Law 100/93
Beneficiaries	National teachers, nationalized and territorial, hired before 31-12-80[3]	National teachers, nationalized teachers, distritals, departmental and municipals[4]	Persons that reach the age of mandatory retirement and do not have own resources for their subsistence	Affiliated with the pay-as-you-go system
Time of service	Typically 20 years	Typically 20 years	He / she is in active service with any time of services	1000 weeks. Worker saves capital that generates at least one pension equal to 110% of the minimum salary
Age	50 years, men or women	If hired after 1-1-90, 50 years for women, 55 years for men; if hired before 1-1-90, 50 years for men and women	55 years old	55 years old women and 60 years old men
Contribution	Nation in charge	Nation in charge	Nation in charge	13.5% until 4 minimum wages. 14.5% for 4 minimum wages and more. 75% paid by employer and 25% by worker
Base salary for calculating pension benefits	Basic monthly compensation, including bonuses and benefits	Average salary during the last year of service	Last monthly salary earned	Average salary in the last 10 years or in the whole work life if he / she has contributed more that 1250 weeks
Pension amount	75%	75%	20%, plus 25% for each year of service	65% with 1000 weeks of contribution, until 85% with 1400 weeks. Individual Saving: Depends on the capital accumulated on the individual saving account

[1] The Nation is in charge of the Special Pension and it is recognized and paid by CAJANAL. The Law established that the Fondo de Pensiones Públicas-FOPEP should do it.

[2] The Nation is in charge of all Retirement Pension that began since the promulgation of Law 91 of 1989 (December 29) and will be paid by the Fondo Nacional de Prestaciones Sociales of the Magistery. But CAJANAL and the Fondo Nacional de Ahorros will be in charge if it is started before the date of promulgagion of that law.

[3] Law 91 of 1989. For the teachers who entered the system since January 1st of 1981, national and nationalized, and for those appointed since 1990, when they accomplished the legal requirements, only one retirement pension is recognized, equivalent to 75% of the monthly average salary of the last year.

[4] Workers Nacionalized, they are the teachers that enter the system by appointment of a territorial entity before January 1st of 1976 and those who entered since that date, according with the established by the Law 43 of 1975.

[3] Comparison of the benefits of the public teachers (national and nationalized). The territorial regims are not included.

Second, teachers qualify to receive the special pension (pensión de gracia) at 50 years of age. Under the pay-as-you-go system set up by Law 100 of 1993 for non-teachers, the retirement age is 55 for women and 60 for men.

Third, a different base salary is used to calculate the pension for teachers and non-teachers. The special pension is based on the basic monthly salary that the teacher had at the time of retirement, including bonuses and other benefits. In addition, the teacher's retirement pension is based on the average salary of the last year employed. In contrast, the pension benefits for non-teachers are based on the average salary in the last 10 years of the entire career if more than 1.250 weeks have been contributed.

Fourth, teachers typically receive 75 percent of the base salary, while non-teachers receive between 65 and 85 percent of the base salary, depending on the number of weeks that the worker contributed to the system.

Finally, the pension regime grants teachers the right to receive several of these pensions simultaneously.

Table 9 documents the liability that the generous pension programs for teachers have created for the Colombian economy. The current liability of the pensions for the 303 thousand active teachers is 30 percent of GDP. This compares to a liability of 40 percent of GDP for the 2.3 million non-teachers covered by the Instituto de Seguros Sociales.

Table 9. Pension Liability in 1999

	Active beneficiaries	Pensioned	Passive liability as percent of GDP
Teachers	303,000	61,848	30.0
Beneficiaries of the Social Security Institute	2,300,000	435,000	40.0

The teacher pension system has obviously imposed a huge liability on the Colombian economy. We have identified three distinct problems that make it unlikely that this liability can be reduced substantially in the short run:

- The level of current expenditures to current pensioners is very high.
- A high proportion of working teachers are nearing retirement age.
- The pension system grants relatively generous and expensive benefits to teachers.

III. Evaluating the Impact of Education Policy Reforms

In view of the substantial changes in education policy adopted by the Colombian government during the 1990s, it is worth investigating if the reforms had an observable impact on the educational opportunities faced by school-ages children. In this section, we examine several related issues. First, how did the reforms affect the economic opportunities available to public school teachers? Second, did the reforms increase the enrollment rate of school-age children? Third, are teacher resources better allocated across localities in the post-reform period (either through increase internal migration of teachers or through increased employment in the localities where teachers were most needed)?

And, finally, is there evidence of geographic convergence in the educational opportunities available to Colombian children?

To evaluate the impact of the education policy reforms, we used the Encuesta Nacional de Hogares (ENH), a national household survey conducted quarterly by the Departamento Administrativo Nacional de Estadística (DANE). The survey covers 10 Colombian cities. Although the five largest cities in the country are covered by the survey, the survey also covers medium-sized and smaller cities. One drawback of using the available ENH data for analyzing the impact of the education reforms is that it only covers the urban labor markets of Colombia. We use the ENH Surveys for June 1991, June 1994, and June 1998. The trends between 1991 and 1994 help us describe what was happening in Colombia's education sector prior to the enactment of the decentralization reforms in Law 60 of 1993. The trends between 1994 and 1998 help us describe the changes that occurred in the post-decentralization period. With the exception of teacher salaries, which experienced a significant increase after 1994, the trends in several measures of educational outcomes are roughly similar both before and after 1994. It seems unlikely, therefore, that the education reforms had much impact on Colombia's education system.

A. Trends in Teacher Salaries

Table 10 summarizes the trends in teachers salaries between 1991 and 1998. Public school teachers earn more than private school teachers and earn far more than the rest of the workers in the Colombian labor market. In 1998, public school teachers earned around 135 percent more than non-teachers, while private school teachers earned about 75 percent more than non-teachers.

Much of the wage advantage accruing to public school teachers can be accounted for by differences in observable socioeconomic characteristics, particularly differences in educational attainment. The wage differentials between teachers and non-teachers fall dramatically when one controls for differences in various socioeconomic characteristics between the groups, including educational attainment, age, hours of work, and region of residence. In 1998, for example, the 135 percent wage advantage enjoyed by public school teachers is reduced to only an 11.3 percent advantage after one controls for differences in some socioeconomic characteristics, particularly educational attainment, between the two groups. Similarly, the 75 percent wage advantage enjoyed by private sector teachers becomes a 4 percent wage disadvantage. In other words, even though private school teachers earn more than the typical worker in the Colombian labor market, they earn slightly less than comparably skilled non-teachers.

Table 10. Teacher Salaries, 1991-1998

	1991		1994		1998	
	(1)	(2)	(1)	(3)	(1)	(3)
Percent wage gap between private-school teachers and non-teachers	19.8	-23.4	31.8	-19.4	74.9	-3.8
Percent wage gap between public-school teachers and non-teachers	80.2	0.7	71.6	-5.0	134.9	11.3
Wage gap adjusted for differences in background characteristics	No	Yes	No	Yes	No	Yes

Source: Appendix Table A-1.

The data also show that the reforms in educational attainment increased the average pay of both public school and private school teachers. The relative salary of teachers was relatively stable between 1991 and 1994, but increased substantially between 1994 and 1998. For example, the unadjusted percent wage gap between public school teachers and non-teachers fell slightly from 80 to 72 percent between 1991 and 1994, but rose from 72 to 135 percent between 1994 and 1998. Similarly, the unadjusted percent wage gap between private school teachers and non-teachers rose from 20 to 32 percent between 1991 and 1994, but rose between 32 to 75 percent between 1994 and 1998.

The fact that the education reforms increased the mean wage of all teachers by roughly the same amount implies that the wage gap between public school and private school teachers remained relatively constant over the period. In both 1994 and 1998, public school teachers earn about 15 percent more than comparably skilled private school teachers. The education reforms enacted in the 1990s, therefore, do not seem to have altered the relative incentives of teachers to enter the public and private sectors. Nevertheless, the increased pay of teachers should, in the end, provide additional incentives for more workers to enter the teaching profession in Colombia.

B. Trends in Enrollment Rates

An explicit goal of the education reforms undertaken by the Colombian government in the 1990s was to provide better educational opportunities for the country's children. Table 11 summarizes some of the key descriptive trends in school enrollment rates in the population of children aged 5 to 16. Perhaps the most striking result is that even though enrollment rates were increasing prior to 1994, there was a slight decline in enrollment rates between 1994 and 1998. The fraction of children aged 5 to 16 enrolled in school rose from 88.6 to 90.6 percent between 1991 and 1994, but declined from 90.6 to 90.1 percent between 1994 and 1998.

Table 11. Enrollment Rates of Children Aged 5-16, 1991-1998

Age group	1991	1994	1998
5-6	76,2	83,9	87,3
7-8	95,8	96,6	95,4
10-13	95,1	95,8	93,7
14-16	80,3	82,2	81,9
All ages	88,6	90,6	90,1

Source: Encuesta Nacional de Hogares. DANE.

There are dramatic variations around this general trend across various age groups. For example, the enrollment rate increased substantially in the post-reform period from 83.9 to 87.3 percent for the youngest children (aged 5 and 6), but declined for all other age groups. Therefore, even though the overall evidence shows that enrollment rates declined between 1994 and 1998, the youngest children -the children who are probably the most likely to be affected by the additional teaching resources- did experience a substantial increase in their enrollment rates. Note, however, that the enrollment rate of this group was rising rapidly even before the education reforms. Between 1991 and 1994, the enrollment rate of children aged 5-6 increased from 76.2 to 83.9 percent. It is difficult, therefore, to attribute much of the 1991-1994 enrollment increase among the youngest children in Colombia to the decentralization reforms.

There is also significant variation in the school enrollment trends across households belonging to different socioeconomic "stratum."[4] As Table 12 shows, there are substantial differences in enrollment rates among children in the different socioeconomic classes, with the lower socioeconomic classes having substantially lower enrollment rates at any given age. For instance, in 1998 the enrollment rate of children aged 10 to 13 who come from the low socioeconomic class was 90.2 percent, the rate for children who come from the middle class was 95.7 percent, and the rate for children who come from the high socioeconomic class was 96.0 percent. Not surprisingly, the household's socioeconomic class is an important determinant of whether the children in that household are enrolled in school.

However, the evidence also shows that the enrollment rate increased most for the youngest children who come from the lower socioeconomic classes. For instance, the enrollment rate of children aged 5 to 6 who come from low socioeconomic class households increased by about 10 percent points in 1991-1994 (before the education reforms), and by an additional 4 percentage points, from 76.7 to 80.9 percent in 1994-1998. Again, it is difficult to infer from the data that the education reforms had much beneficial impact on the enrollment rates of disadvantaged young children in Colombia.

Table 12. Enrollment Rates, by Socioeconomic Strata

	Low			Middle			High		
Age group	**1991**	**1994**	**1998**	**1991**	**1994**	**1998**	**1991**	**1994**	**1998**
5-6	66.4	76.7	80.9	81.2	87.8	90.5	92	96.9	98.2
7-8	93.5	94.5	92.2	97.1	97.9	97.3	99	98.2	97.3
10-13	92.6	93.5	90.2	96.4	97.0	95.7	98	97.6	96.0
14-16	70.2	73.8	73.1	85.4	86.5	86.9	84	89.6	85.6
All ages	83.4	86.2	85.0	91.4	93.0	93.0	93	95.1	94.0

Source: Encuesta Nacional de Hogares. DANE.

C. Internal Migration of Teachers

The debate over the performance of the public education sector in Colombia often assumes that there is a misallocation of teachers across geographic areas. There are "too many" teachers in some locations, and "too few" in others. This misallocation of teachers can generate a substantial amount of inefficiency in the provision of public education to Colombia's children. In effect, teachers are relatively scarce in those areas where they are most needed, and relatively abundant in less crucial localities.

This type of discussion effectively assumes that teachers-and public school teachers, in particular-exhibit a type of "job lock." Because of political, social, or economic reasons, teachers resist moving across localities once they obtain a teaching position. In this section we examine the validity of the hypothesis that teachers are particularly immobile in the Colombian labor market.

By definition, a migrant is a worker who has resided in the current city for two years or less. Table 13 summarizes the descriptive evidence on migration rates available in the ENH. The data clearly show that teachers, regardless of whether they teach in public or private schools, have substantially lower migration rates than non-teachers. For instance, the migration rate for non-teachers is 6.7

[4] The definitions are as follows: the "low" socioeconomic group has values of "low-low" or "low" in the stratum variable contained in the ENH; the "middle" group has values of "medium-low" or "medium"; and the "high" group has values of "medium-high" or "high".

Table 13. Migration Rates of Teachers and Non-teachers, 1991-1998

	Percent of workers who migrated in the last two years		
	1991	**1994**	**1998**
Public school teachers	5.1	4.8	3.4
Private school teachers	5.6	5.0	4.3
All others workers	6.7	7.4	6.7

Source: Appendix Table A-2.

percent in the 1998 ENH survey, indicating that 6.7 percent of non-teachers had moved across localities in the two-year period prior to the survey (i.e., between 1996 and 1998). The mobility rate of workers in the teaching profession is far lower. In 1998, for example, only 4.3 percent of private school teachers and 3.4 percent of public school teachers had moved across cities in the prior two years. In short, teachers have substantially lower internal migration rates than non-teachers, and public school teachers seem to have particularly low migration rates. It is also worth noting that there was a marked *decline* in internal migration rates of public school teachers both between 1991 and 1994, and between 1994 and 1998. The migration rates for these teachers fell from 5.1 to 4.8 percent between 1991 and 1994, and from 4.8 to 3.4 percent between 1994 and 1998. If anything, the inefficiencies implied by job-lock among public school teachers increased during the period of the education reforms.

Remarkably, much of the gap in internal migration rates between teachers and non-teachers disappears once we adjust for differences in socioeconomic characteristics among the various groups, particularly their age. In 1998, the unadjusted difference in the probability of migration between public school teachers and non-teachers is 3.4 percentage points. We show in the Technical Appendix that this unadjusted gap drops to 1.4 percentage points (and is not statistically significant) when the regression specification is expanded to include the worker's age as a regressor, and drops further to 0.4 percentage points when the regression also includes the worker's educational attainment.

It should not be surprising that a large part of the unadjusted migration rate differential between public school teachers and non-teachers can be attributed to differences in socioeconomic characteristics between the groups, particularly differences in their age distribution. After all, it is well known that migration rates decline with age in many countries (Greenwood, 1997). In the United States, for example, 7.2 percent of college graduates in their late 20s moved across state lines between 1996 and 1997, as compared to 2.4 percent of college graduates aged 35 to 45, and 1.6 percent of college graduates in their 50s (U.S. Department of Commerce, 1997, Table 5). Labor economists typically explain this empirical pattern by arguing that the economic payoff to internal migration, like the economic payoff to all human capital investments, decline as workers get older (since older workers have fewer years in which to recoup the costs of making the move to their new location).

As we noted earlier, public school teachers in Colombia are, on average, much older than other workers. In 1998, for example, the typical public school teacher was 42.0 years old, as compared to 34.7 years old for private school teachers, and 35.1 years old for non-teachers. This sizable difference in the mean age between public school teachers and other workers is the key factor responsible for the relative immobility of teachers in the Colombian labor market. In other words, Colombian public school teachers are relatively less mobile not because of factors that are specific to the teaching profession, but because public school teachers are substantially older and internal migration rates tend to decline with age.

This simple fact may have important implications for future discussions of education policy and teacher mobility in Colombia. After all, it is probably desirable to reduce the inefficiency created in the education sector by the job-lock of teachers attached to particular regions. Ideally, teaching resources would be fluid across localities, responding to market needs. One obvious incentive system that would motivate teachers to move across areas would be to institute a system of regional differences in teacher pay, with the financial rewards being greater in those areas where teaching resources are most needed. The fact that teachers tend to be relatively older, however, implies that the regional wage differentials required to induce teachers to migrate to the targeted cities might have to be substantial. As a result, it may be relatively expensive to reduce inefficiencies in the education sector in Colombia by encouraging more internal migration of public school teachers.

Finally, it is worth noting that the analysis presented in this section does not provide any evidence on an additional source of allocative inefficiency that is also part of the debate over education policy in Colombia, namely the allocation of teaching resources between the urban and rural sectors. The available ENH data only provides information for workers who reside in the largest metropolitan areas. It seems plausible to conjecture that there is even less internal migration of teachers between the rural and urban sectors. Future research should make it a priority to measure the extent and determinants of job-lock in teacher resources between these sectors.

D. Determinants of the Increase in the Number of Teachers

Because teachers are relatively immobile across cities in Colombia, the government could improve access to educational opportunities in "disadvantaged" areas by hiring relatively more teachers in those cities where the school-going population is growing rapidly or where there is a relative shortage of teachers relative to the size of the school-going population. There was, in fact, a substantial increase in the number of teachers-employed in both private and public schools-between 1991 and 1998. In 1991 there were 220,127 public sector teachers and 77,500 private teachers In 1994, there were 231,992 public sector teachers and 98,615 private sector teachers. By 1998, there were 303,225 public sector teachers and around 125,000 private sector teachers.

It is well known that there are long-standing structural differences in access to publicly provided educational opportunities across regions and cities in Colombia. Hence it is of interest to investigate if the teaching resources provided by the additional hires were allocated in ways that cater to the needs of the school-going population. In particular, did teacher employment grow fastest in the areas where the teachers would seem to be most needed?Our analysis (summarized in the Technical Appendix) indicated that the percentage increase in the number of public school teachers allocated to a particular geographic area between 1994 and 1998 was greatest in those areas that had the largest number of potential students per available teacher as of 1994. This correlation, moreover, is statistically significant and numerically important. An increase of about 20 percent in the children-teacher ratio in 1994 is associated with an additional 15 percentage points of employment growth for public school teachers between 1994 and 1998. It seems, therefore, that the additional education resources -in terms of additional teacher employment- were indeed allocated to the areas most in need.

Our empirical analysis indicates that this correlation was also positive, but statistically very weak, in the 1991-1994 period. In other words, there is some evidence that even before the decentralization reforms the number of public school teachers was growing somewhat more rapidly in those areas with the greatest "client population". This correlation, however, was not statistically significant in the 1991-1994 period. It seems, therefore, that the education reforms helped to strengthen the efficient sorting of new teaching resources across geographic areas in Colombia.

E. Geographic Convergence in Educational Opportunities

An important goal of the educational reforms enacted during the 1991s was to equalize the educational opportunities available across localities in Colombia. Our data indicates that there was some convergence in educational opportunities across the 30 cities that are identified in the ENH between 1991 and 1998.

Our empirical analysis (described in the Technical Appendix) shows that there was a narrowing of differences in the following variables between 1994 and 1998:

- The number of school-age children per teacher.
- The enrollment rate (defined as the fraction of the school-age population that is enrolled in school).
- The pupil/teacher ratio

Before one can attribute the 1994-1998 equalization of outcomes across geographic areas to the decentralization reforms, however, it is important to determine the nature of the pre-existing trends. The Technical Appendix also shows that the narrowing in these measures of education opportunities was already occurring even prior to 1994. Moreover, the convergence trends-from a statistical perspective-seem to be as strong before 1994 as they are after 1994. In short, it is difficult to attribute any of the post-1994 geographical convergence in educational opportunities to the decentralization reforms adopted by Colombia in 1993.

It is important to note that we do not know if the convergence found across the 30 cities surveyed in the ENH also applies to the wider differences in educational access that exist between the rural and urban sectors.

IV. Policy Implications

This paper has identified a number of problems in the administration of the education system in Colombia, and has assessed the extent to which the education reforms adopted in the early 1990s have changed teacher salaries and educational opportunities for Colombia's children. Overall, our empirical results do not suggest that the education reforms adopted in Law 60 of 1993 had much impact on the education system. Therefore, many issues remain to be addressed to improve efficiency in the education system. These include:

A. More Decentralization

There remains a great deal of confusion in the civil service system facing teachers. Much of this confusion arises because the local jurisdictions that hire teachers have little say over how teacher pay is determined. At the present, teachers can be hired by authorities in the central government, in the Departments, or in the municipalities. Teacher salaries and pension benefits, however, are centrally determined. Moreover, temporary teaching jobs are created by localities, but they often ignore the fact that because of the provisons of the Estatuto Docente, these temporary positions often evolve into permanent positions.

The efficiency of the education system would be greatly enhanced if the hiring and salary decisions were made by the same government jurisdictions. This simple change in the "rules" would encourage

those who make the decision of hiring a teacher to pay attention to the cost of the decision; as well as encourage those who set teacher salaries to pay more attention to the factors that determine how many and which teachers are employed. This simple reform of the system would introduce much-needed accountability into the civil service for teachers. The teachers union, FECODE, would likely be opposed to this reform because it would decentralize the labor market for teachers.

B. Allow regional wage differentials

The central setting of teacher salaries creates serious inequities in real pay across geographic regions of Colombia. Obviously, there are cost of living differentials and differences in amenities across the various areas of Colombia. By setting a constant nominal salary for teachers throughout the whole country, the central authorities are effectively creating differences in economic opportunities that make working in some areas more valuable than working in other areas. Given these differences in real wages, it should not surprising that teaching resources are not optimally allocated across Colombia's geographic regions in the present system.

A simple-though inevitably controversial-change in the pay-setting rules would help remove much of this inefficiency. The government should allow nominal differences in pay across regions in Colombia, so that the real wage would be roughly constant across Colombia's geographic regions. A constant real wage implies that all geographic areas would be equally remunerative, so that teachers would not necessarily prefer to work in one area over another. In short, local labor market conditions, rather than a central mandate of nominal pay equality for all teachers, would determine the salaries of teachers in Colombia. If there were a shortage in the supply of teachers to a particular locality, salaries in that region would rise -relative to the salary in the other regions- and thereby attract more teachers.

C. Pension Reform

The teachers were excluded from the last round of pension reform. At the present time, teachers do not make any financial contribution to their pension programs. Furthermore, the fund created by the government to cover the pension payments that will eventually have to be made to teachers has a huge liability, amounting to 30 percent of GDP. In its agreement with the International Monetary Fund, the Colombian government agreed to extend the pensions reforms of 1994. Reforming the teacher pension program should be a central aspect of any pension reform that is undertaken in the future.

Currently, teachers can retire when they reach the age of 50. Many teachers, in fact, do not retire at that age, but collect one of the pension benefits available to them while still working in the teaching profession. We conclude that any pension reform for teachers should incorporate two key changes. First, it should increase the age of retirement. Second, it should discourage "double-dipping" and "triple-dipping" from the various teacher pensions.

Our data indicate that teachers are relatively older than other workers, so that a large number of teachers will be retiring within the next decade. The huge expenditure that will be necessary to meet the pension liability at that time can be somewhat reduced by making teachers eligible for pensions at the same time as all other workers in Colombia (i.e., age 55 for women and 60 for men). The government could also reduce the costs by imposing taxes on teacher pension benefits if the teacher remains employed after "retirement." In the long run, the pension reform should strive to consolidate

the various retirement programs available to teachers into a single program, thus reducing the chances that teachers -unlike other workers in Colombia- can receive two or three pension benefits in their retirement years.

It would suit the integration of the youngest teachers and of the new ones to the general regime, for reasons of justness, to take advantage of the advantages of their long labor careers and their continuity, to introduce competition and efficiency in administration, and to offer freedom and mobility to the teachers, in benefit of the education.

D. The Escuela Nueva and Other Reforms

Our discussion has focused on ways to improve the administrative efficiency of the education system. It is clear that there is an equally pressing need to improve the quality of education provided in Colombia's public schools. Only 20 percent of the children who enter first grade finish the program of basic education. Moreover, only about a third of those who complete their basic education do not repeat a school year.

The Escuela Nueva, a school program that has been widely adopted in Colombia's rural sector, seems to have had significant success in improving education opportunities available in that area. Under this program, teachers have much greater flexibility in making their own decisions regarding the education process in their classroom. The curriculum is also more independently targeted to different students and stresses practical problem solving, so that it more easily engages the students. Parents are also involved through increased participation in school activities. It would be worthwhile to examine whether this type of program could be expanded to cover Colombia's public schools in urban areas.

The recent reforms adopted by Bogotá and Antioquia also show the promise of decentralization and choosing different institutional frameworks in urban settings. In Bogotá, the local administration increased the number of "places" for students by 140,000; with slightly over half (80,000) obtained by making better use of existing resources, and the remainder by granting funds to private schools to build new schools in the poorest areas. The new administrators received "vouchers" equal to what it would cost to educate a child in one of the purely public schools. These administrators take all responsibility over the recruiting of teachers and the administration of the school. The evidence suggests that parents prefer these "mixed" private-public schools, both because of the quality of the school administration and because of the absence of labor conflict that has been a hallmark of Colombia's public schools in the past.

The Department of Antioquia pioneered this type of decentralization. Under the administration of Governor Alvaro Uribe Vélez (1995-1997), Antioquia wanted to create 100,000 new places for students without increasing the number of teachers. They achieved this goal by reaching agreements with professors' associations and with religious communities, again paying the communities what it would cost to educate a child in the traditional public school system.

References

Ayala, U., C. Soto, L. Hernández (1999), "La remuneración y el mercado de trabajo de los maestros públicos en Bogotá" en *Coyuntura Social* N0. 20, Fedesarrollo, mayo.

Barro, R. (1991), "Economic Growth in a Cross-Section of Countries" in *Quarterly Journal of Economics* No. 106, May.

Caro, B. y A. Sarmiento (199), *La educación en cifras: Avances en el Periodo 1985-1997*. Bogotá, Colombia

Comisión de Racionalización del Gasto y de las Finanzas Públicas,CRGP (1997), Informe Final. El Saneamiento Fiscal, un Compromiso de la Sociedad. Tema III. Descentralización. Capítulo Gasto Público en Educación Básica.

Coyuntura Social (1999), Análisis Coyuntural: "Cómo vá la descentralización en el país?", No. 20, Fedesarrollo, mayo.

Departamento Nacional de Planeación (1999), *Gasto Social 1980-1997*. Colombia: Publicación Seriada N°21, [Quebecor / Impreandes Colombia S.A.]

Departamento Nacional de Planeación (1998), Primer Seminario Internacional de Análisis y de Diseño Institucional, *Hacia el Rediseño del Estado*.

Departamento Nacional de Planeación (1999), *La Educación en Cifras*, Colombia: Publicación Seriada N°19, [Quebecor / Impreandes Colombia S.A.]

Departamento Nacional de Planeación (2000), *Indicadores de Coyuntura Social*, Colombia: Publicación Seriada N°24, [Quebecor / Impreandes Colombia S.A.]

Duarte-Agudelo, J. (1995), *State education and clientelism in Colombia (The politics of state education administration and of implementation of educational investment projects in two colombian regions)*. Thesis submitted in partial fulfilment of the requirements for the degree of D. Phil. In Politics in the Faculty of Social Studies at the University of Oxford.

Duarte - Agudelo, J. (1996), "La Debilidad del Ministerio de Educación y la politización de la educación: dos problemas a enfrentar en el Plan Decenal", en *Coyuntura Económica* No. 14, Fedesarrollo.

Fedesarrollo. Proyecto Agenda Colombia (1998), *Sector Educativo: Diagnóstico y Recomendaciones*.

Gómez, Buendia H., y R. Losada-Lora (1984), *Organización y Conflicto: La educación primaria oficial en Colombia*.

Gomez, Buendia H., R. Londoño, G. Perry (1986), *Sindicalismo y Política Economica*, Fedesarrollo-Cerec.

Gonzalez, Jorge I., A. Sarmiento et al. (1998), *Estructura, evolución y determinantes del salario en el sector público*. Misión Social del Departamento Nacional de Planeación, Departamento Administrativo de la Función Pública y Ministerio de trabajo. Mimeo.

Greenwood, Michael J. (1997), "Internal Migration in Developed Countries," in Mark R. Rosenzweig and Oded Stark, editors, *Handbook of Population and Family Economics*, Volume 1B, Amsterdam: Elsevier.

Informe de la Misión de Empleo, o Informe Chenery (1986), *El Problema Laboral Colombiano: Diagnóstico, Perspectivas y Políticas*, agosto septiembre.

Mankiw, N., G. D. Romer, and D. N. Weil (1992), "A Contribution to the Empirics of Economic Growth." *Quarterly Journal of Economics* No. 107 May.

Molina, A. (1998), *Servicio Civil*. Documento de Trabajo División Especial de Evaluación, Departamento Nacional de Planeación, Mimeo.

Mora, H., U. Ayala, C. Gutierrez, A. Velasco (1999), *Financiamiento de la educación: evaluación de la viabilidad del sistema de capitalización*, trabajo presentado en el Foro convocado por la Fundación Corona y El Tiempo.

Proyecto de Reforma Pensional (2000).

Sánchez, F. et al. (1999), "Quién se Benefició del Gasto Social en los Noventa", en *Coyuntura Social* No 20, Fedesarrollo, mayo.

Sarmiento, A., B. Caro, (1997), "El avance de la Educación en Colombia: lento, insuficiente e inequitativo", en *Planeación y Desarrollo*, Vol. XXVIII.

Sarmiento, A. (1999), "La educación en el Plan Nacional de Desarrollo: "Cambio para Construir la Paz 1998-2002"", en *Debates de Coyuntura Social*, No. 12: 90-98.

U.S. Department of Commerce (1997), Geographical Mobility: March 1996 to March 1997 (Update), Current Population Reports, P20-510. Government Printing Office, Washington, DC

Younes Moreno Diego (1992), *Las reformas del Estado y la Administración Pública*, Editorial Temis.

World Bank (1994), *Civil Service Reform in Latin America and the Caribbean*, Proceedings of a Conference Edited by Shahid Amjad Chaudhry , Gary James Reid, and Waleed Haider Malik.

World Bank (1995), *Making Decentralization Work*, November.

Technical Appendix: Measuring the impact of education policy reforms

This technical appendix uses data drawn from the Encuesta Nacional de Hogares (ENH), a national household survey conducted quarterly by the Departamento Administrativo Nacional de Estadística (DANE). The survey covers 10 Colombian cities. Although the five largest cities in the country are covered by the survey, it also covers medium-sized and smaller cities. One drawback of using the ENH for analyzing the impact of the education reforms is that it only covers the urban labor markets of Colombia.

The survey provides information on household characteristics (such as place of residence and years since the last migration), and on each respondent's characteristics (such as age, sex, educational attainment, marital status, and place of birth). The ENH also provides information on a person's labor market status, and, if employed, on the worker's industry and occupation of employment, monthly salary, and hours of work. We use the June ENH surveys in the calendar years 1991, 1994, and 1998 in our study. The June surveys contain particularly detailed labor market information.

Finally, the ENH uses a random stratified sampling approach. The basic unit of observation in the survey is the household. We use the sampling weights provided by the ENH throughout the analysis.

Trends in Teacher Salaries

We use the various ENH surveys to calculate both the adjusted and unadjusted wage differential between teachers and non-teachers in the Colombian labor market. We calculate these wage differentials for two types of teachers: public school and private school teachers. A worker is a public school teacher if he or she reports an occupation of «teacher» in the ENH and works in the public sector. A worker is a private school teacher if he or she reports an occupation of teacher and works in the private sector.

We estimate the following earnings function separately in each of the ENH surveys:

$$(1)\ \log w_i = X_i\beta + \alpha_1 PU_i + \alpha_2 PR_i + \varepsilon_i,$$

where w_i gives the (monthly) monetary income of worker i; X is a vector of socioeconomic characteristics (described below); PU_i is a dummy variable set to unity if the worker is a public school teacher; and PR_i is a dummy variable set to unity if the worker is a private school teacher. The regression model is estimated in the sample of workers aged 18-64.

Initially, we do not include any variables in the standardizing vector X. The coefficients α_1 and α_2 then measure the unadjusted wage differentials among the various types of workers in the Colombian labor market. The coefficients reported in the first column of Table A-1 indicate that public school teachers earn more than private school teachers and earn far more than the rest of the workers in the Colombian labor market. In 1994, the log wage differential between public school teachers and non-teachers was 0.54, which translates to an approximate 71.6 percent wage differential between the two groups.[1] Similarly, the log wage differential between public school and private school teachers was 0.276, which translates to an approximate 31.8 percent wage differential between the two groups.

[1] The approximate percent wage differential is given by $(e^{.540} - 1) \times 100$.

The regression coefficients reported in Table A-1 reveal that much of the wage advantage accruing to public school teachers can be accounted for by differences in observable socioeconomic characteristics, particularly differences in educational attainment. The wage differentials between teachers and non-teachers fall dramatically when the vector X is expanded to include the worker's educational attainment.[2] In 1994, for example, the 0.54 log wage advantaged enjoyed by public school teachers plummets to a -0.051 log wage disadvantage once the regression controls for educational attainment, while the 0.276 log wage advantaged enjoyed by private sector teachers becomes a -0.216 log wage disadvantage. In other words, even though teachers earn more than the typical worker in the Colombian labor market, they earn less than comparably skilled non-teachers.

Internal Migration of Teachers

The ENH surveys report the number of years that they have resided in their current location. We define a worker to be a migrant if he or she has resided in the current city for two years or less. We restrict our study of internal migration to the sample of persons who are working at the time of the survey and who are 18 to 60 years old.

Much of the gap in internal migration rates between teachers and non-teachers disappears once we adjust for differences in socioeconomic characteristics among the various groups, particularly their age.[3] Consider the regression model:

$$(2)\ m_i = X_i\beta + \alpha 1\ PU_i + a_2\ PR_i + \varepsilon_i,$$

where m_i is a dummy variable set to unity if worker i moved across cities in the two-year period prior to the survey. As before, X is a vector of socioeconomic characteristics; PU_i is a dummy variable

Table A-1. Salary Differentials Between Teachers and Non-Teachers, 1991-1998

	Regression models estimated in 1991 ENH			Regression models estimated in 1994 ENH			Regression models estimated in 1998 ENH		
Variable	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Private-school	.181	.301	-.267	.276	.357	-.216	.559	.642	-.039
Teachers	(.039)	(.037)	(.031)	(.039)	(.038)	(.034)	(.035)	(.034)	(.030)
Public-school	.589	.595	.007	.540	.548	-.051	.854	.866	.107
Teachers	(.035)	(.033)	(.028)	(.037)	(.035)	(.032)	(.035)	(.034)	(.030)
Constrols for:									
Age, sex	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Education	No	No	Yes	No	No	Yes	No	No	Yes

Notes: The standard errors are reported in parentheses. The regressions are estimated in the sample of workers aged 18 to 64. The regressions in the 1991 sample have 29,112 observations. The regressions in the 1994 sample have 28,532 observations. The regressions in the 1998 sample have 29,436 observations.
Source: Author's calculations. ENH-DANE.

[2] We control for the worker's educational attainment by including a vector of dummy variables indicating if the worker has no education, has primary education, has secondary education, or has higher education.

[3] Greenwood (1997) surveys the internal migration literature and discusses the determinants of internal migration in a number of developed countries.

set to unity if the worker is a public school teacher; and PR_i is a dummy variable set to unity if the worker is a private school teacher. We estimated equation (2) separately in the 1994 and 1998 surveys, and used the sample of workers who are 18 to 60 years old.

The last six columns of Table A-2 report the differences in migration rates between teachers and non-teachers (i.e., the coefficients α_1 and α_2) after controlling for various sets of socioeconomic characteristics. In 1998, the unadjusted difference in the probability of migration between public school teachers and non-teachers is 3.4 percentage points. Table A-2 shows that this unadjusted gap drops to 1.4 percentage points (and is not statistically significant) when the regression specification is expanded to include the worker's age as a regressor, and drops further to .4 percentage points when the regression also includes the worker's educational attainment.

Determinants of the Increase in the Number of Teachers

We aggregated the ENH household data to the city level, and calculated measures of teacher employment and educational activities for each of the 30 cities that can be matched in the 1994 and 1998 ENH surveys. Table A-3 summarizes some of the aggregate statistics that can be calculated from the ENH at the city level. It is evident that the number of public school teachers rose at a substantially faster rate in some areas. The number of public school teachers, for example, rose by 0.586 log points in Barranquilla, by 0.460 log points in Bogotá, and by 0.125 log points in Medellin. The table also illustrates significant regional differences in the educational resources available to students. In 1994, for example, there were 23.3 school-age children per teacher in Barranquilla, 17.4 in Bogotá, and 28.6 in Soledad.

To examine the question of whether the increase in the number of teachers between 1994 and 1998 occurred in those cities where they would seem to be most needed, we estimated a number of regression models with the generic specification:

$$(3)\ g_j = \alpha + \beta \log (C_j / T_j) + \text{other variables} + \varepsilon_j,$$

where g_j gives the rate of growth in the number of public school teachers employed in city j (defined as the log of the ratio of the number of public school teachers employed in 1998 to the number employed in 1994); C_j gives the size of the school-age population in the city (defined as the number

Table A-2. Differentials in Migration Rates Between Teachers and Non-Teachers, 1991-1998

	Probability of migration			Adjusted differences 1994			Adjusted differences 1994		
Variable	**1991**	**1992**	**1993**	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Public-school	.051	.084	.034	-.026	-.006	.017	-.034	-.014	.004
Teachers		.048		(.011)	(.011)	(.012)	(.009)	(.009)	(.010)
Private-school	.056	.050	.043	-.024	-.021	-.001	-.024	-.026	-.010
Teachers				(.012)	(.012)	(.012)	(.009)	(.009)	(.009)
All other									
Workers	.067	.074	.067	-	-	-	-	-	-

Notes: Standard errors are reported in parentheses. The regressions are estimated in the sample of workers aged 18 to 60. The regressions in the 1994 sample have 30,560 observations. The regressions in the 1998 sample have 32,714 observations.
Source: Author's calculations. ENH-DANE.

Table A-3. Regional Differences in the Education Sector (for selected cities)

	Rate of Growth in the number of					
	Private school teachers	Public school teachers	School-age children	Number of children per teacher in 1994	Number of students per teachers in 1994	Number of obervations
Barranquilla	0.315	0.586	0.060	23.3	21.5	9837
Bello	1.013	-0.744	0.101	23.4	21.7	1020
Bogotá	0.657	0.460	0.109	17.4	16.1	9694
Bucaramanga	0.427	0.288	0.179	19.4	17.0	4928
Cali	0.375	0.527	0.136	22.6	19.7	8826
Cúcuta	0.260	-0.280	0.198	15.0	12.8	5855
Dosquebradas	0.586	0.378	0.119	18.8	17.0	2096
Floridablenca	1.061	0.721	0.277	21.9	20.1	2227
Maizales	0.747	-0.069	0.029	11.8	11.0	7206
Medellín	0.420	0.125	0.211	18.7	16.5	9801
Pasto	0.061	0.176	0.197	8.7	7.6	7600
Pereira	0.389	0.173	0.106	19.1	16.9	4600
Soledad	0.724	0.821	0.074	28.6	27.1	2492
Villavicencio	-0.020	0.840	0.097	32.1	28.1	7141

Source: Author's calculations. ENH-DANE.

of children aged 5 to 16 in 1994), and T_j gives the total number of teachers employed in the city as of 1994. The ratio C_j / T_j, therefore, gives the number of school-age children per available teacher in 1994. If the new hires were allocated to those cities where they are most needed (in terms of their presumed educational impact), one would expect the coefficient β to be positive, as the teacher employment growth should have occurred in those cities where there are the most potential students per available teacher. To determine if the impact of the number of school-age children per available teacher on the growth in the employment of public school teachers was affected by the education reforms, we also estimated equation (3) using the respective data from the 1991-1994 period. The comparison of the two regressions would allow us to determine if the trends are similar pre- and post-decentralization. Finally, we estimated the various regression models using an alternative dependent variable: the growth rate in the number of teachers employed in private schools in city j.

The key results of the regression analysis are reported in Table A-4. It is evident that the 1994-1998 percentage increase in the number of public school teachers was greatest in those areas that had the largest number of potential students per available teacher as of 1994. This correlation, moreover, is statistically significant and numerically important since the elasticity is nearly one. The regression results for 1991-1994 also indicate that the point estimate of the coefficient β is positive. Note, however, that it is not statistically significant. The allocative efficiency associated with putting new teaching resources in the areas with the greatest need, therefore, seems to be greater in the post-reform period.

The regressions suggest a number of additional interesting findings. For example, although there is a strong correlation between the employment growth of public school teachers and the initial number of school-age children per available teacher, no such correlation exists for private school teachers in 1994-1998. In other words, the "need for teachers" helps explain the regional dispersion in the employment growth of public school teachers, but does not help explain the regional dispersion in the employment growth of private school teachers.

Second, the regressions also show that the correlation measured by the coefficient β in equation (3) remains even after we control for additional factors that might generate an increase in the number

Table A-4. Determinants of Rate of Growth in the Employment of Teachers

	Teachers in public school				Teachers in private schools			
	1991-1994		1994-1998		1991-1994		1994-1998	
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**
Log (number of children per teacher in 1994)	.145 (.267)	.196 (.267)	.757 (.259)	.834 (.272)	.657 (.376)	.722 (.334)	.292 (.410)	.424 (.449)
Rate of growth in city's average income	- -	2.156 (1.166)	- -	1,863 (0.716)	- -	1.987 (1.534)	- -	1.744 (1.241)
Rate of growth in number of school-age children	- -	-.172 (0.902)	- -	.206 (0.864)	- -	-1.624 (1.306)	- -	.301 (1.561)
Log (number of public school teachers in 1994)	- -	-.023 (0.047)	- -	- -	- -	.096 (0.053)	- -	- -
Log (number of private school teachers in 1994)	- -	- -	- -	-.047 (0.059)	- -	- -	- -	-.052 (.073)
R-squared	.014	.186	.271	.460	.122	.410	.026	.133
Sample size	23	23	25	25	24	24	21	21

Notes: Standars errors are reported in parentheses.
Source: Author's calculations. ENH-DANE.

of public school teachers employed in a particular locality. For example, the regressions included a measure of the increase in income in the locality.[4] It is likely that localities where incomes are rising faster might «spend» some of the additional wealth on additional teachers. In fact, there is a strong positive correlation between fast-rising incomes and the increasing employment of public and private school teachers, but it remains the case that the number of public school teachers rose most in the cities where they are many potential students per available teacher.

Geographic Convergence in Educational Opportunities

Our convergence regression model is designed to estimate the extent to which educational opportunities converge across localities over a particular time period. One possible variable of interest is the relative number of school-age children per teacher in the locality. The generic regression model has the form:

$$(4)\ \Delta\log(C_{jt} / T_{jt}) = \alpha + \delta \log(C_{j,t-1} / T_{j,t-1}) + e_{jt},$$

where C_{jt} gives the number of school-age children (aged 5 to 16) in city j at time t; and T_{jt} gives the total number of teachers in the city at time t. The dependent variable, therefore, gives the log change in the number of school-age children per teacher between 1991 and 1994 or between 1994 and 1998. The independent variable gives the level of this variable as of 1991 or as of 1994, depending on the regression specification.

[4] This variable is given by the change in the city's mean log income between 1991 and 1994, or between 1994 and 1998.

The regression model in equation (4) resembles the typical convergence models estimated in the cross-country growth literature (Barro, 1991; Mankiw, Romer, and Weil, 1992). The coefficient δ is the convergence parameter. This coefficient measures the extent to which educational opportunities (as measured by the number of school-age children per teacher) were equalized across localities over a particular time period. The coefficient δ for the regression estimated over the 1994-1998 period would be negative if the policy changes implemented in that time period helped equalize educational opportunities across cities. If δ were positive, it would imply divergence in educational opportunities, for the cities where there were many children per teacher in 1994 were also the cities that experienced the highest increase in this variable during the 1994-1998 period.

Table A-5 summarizes some of the evidence from our convergence regressions for both the 1991-1994 and 1994-1998 periods. The top panel of the table shows that the estimated convergence coefficient δ is consistently negative in all the specifications, indicating that there was indeed a narrowing of differences in the number of school-age children per teacher across the 30 Colombian cities in the ENH data both between 1991 and 1994 and between 1994 and 1998. In the 1991-94 period, the estimate of δ is -.516, with a standard error of .177. In the 1994-1998 period, the estimate of δ is -.473, with a standard error of .235. In other words, the change in the number of school-age children per teacher was smallest (i.e., most negative) in those cities that had the most school-age children per teacher at the beginning of the period. The regression analysis, therefore, implies that the rate of convergence in the number of school-age children per teacher was not affected by the education reforms.

Table A-5. Convergence Regressions

	Sample period			
	1991-1994		1994-1998	
Dependent variable	**(1)**	**(2)**	**(1)**	**(2)**
Change in log (number of school-age children per teacher)				
Log (number of school-age children per teacher at	-.516	-.514	-.473	-.754
beginning of cample period)	(.183)	(.170)	(.235)	(.186)
Change in log incomes over sample period	-	-1,753	-	-2,102
	-	(.758)	-	(.467)
Change in log (enrollment rate)				
Log (enrollment rate at beginning of sample period)	-.200	-.217	-.433	-.401
	(.117)	(.116)	(.150)	(.149)
Change in log incomes over sample period	-	.101	-	-.004
	-	(.072)	-	(.048)
Change in log (number of students per teacher)				
Log (number of students per teacher at beginning	-.524	-.517	-.588	-.791
of sample period)	(.177)	(.166)	(.234)	(.178)
Change in log incomes over sample period	-	-1,631	-	-2,052
	-	(.760)	-	(.447)

Notes: Standard errors are reported in parentheses. The 1991-1994 convergence regressions have 29 observations. The sample sizes for the 1994-1998 convergence regressions are as follows: The regressions for the number of school-age children per teacher have 26 observations; the regressions for the enrollment rate have 29 observations; and the regressions for the number of students per teacher have 26 observations. All regressions are weighted by the sample size of the cell used for calculating the dependent variable.
Source: Author's calculations. ENH-DANE.

The remaining panels of the table attempt to determine if there was convergence in other measures of educational output. The middle panel of the table, for example, shows that there was also a great deal of convergence in the enrollment rate across cities (where the enrollment rate is defined as the fraction of the school-age population that is enrolled in school). As before, the convergence coefficient is negative and significant in both time periods. Finally, the bottom panel of the table examines the degree of convergence that took place in the pupil/teacher ratio, a commonly used measure of educational quality in the literature. The evidence again indicates that there was a great deal of convergence in the pupil/teacher ratio in the both the 1991-1994 and 1994-1998 periods.

Overall, we find strong evidence of equalization of educational opportunities across Colombia's localities throughout the 1990s. The evidence does not suggest that much of this convergence can be attributed to the education reforms because the rate of convergence is roughly constant throughout the decade.

E-mail: administrator@fedesarrollo.org.co
http://www.fedesarrollo.org.co